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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL DEVELOPMENT ASSOCIATION

APPRAISAL OF

A SECOND RAILWAY PROJECT

KOREA

November 21, 1967

Projects Department

CURRENCY EQUIVALENTS

US$ 1	=	Won 265
Won 1	=	US$ 0.0038
Won 1,000,000	=	US$ 3,773

WEIGHTS AND MEASURES EQUIVALENTS

1 m	=	3.28 ft
1 km	=	0.62 mi
1 km^2	=	0.386 sq mi
1 kg	=	2.205 lb
1 m ton	=	2,205 lb

FISCAL YEAR

January 1 - December 31

KOREA

APPRAISAL OF A SECOND RAILROAD PROJECT

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This Appraisal Report is based on the findings of an appraisal mission in April, 1967, consisting of Messrs. MacKay, Chapman and Parthasarathi. Messrs. Brandreth and De Gryse contributed to the preparation of the report.

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APPRAISAL OF A SECOND RAILROAD PROJECT

SUMMARY

i. The Government of the Republic of Korea has asked the Association for a credit of US$ 11 million equivalent to help finance the first three years of the Korean National Railroad (KNR) Development Program which is part of the Second Five-Year Economic Development Plan, 1967-1971, of Korea. KNR's investments during the period 1967-1969 are estimated at 42.5 billion Won (US$ 160 million equivalent) with a foreign exchange component of US$ 64 million equivalent.

ii. In 1962 the Republic of Korea received an IDA credit (No. 25-KO) of US$ 14 million equivalent to finance purchases and services under KNR's Development Program, 1962-1966. The project has been completed satisfactorily.

iii. In 1965 the Bank financed the foreign exchange cost (US$ 388,000) of a detailed, integrated transportation survey for the entire country and all modes of transport. This survey was completed in 1966. KNR's Development Program, 1967-1971, is based largely on recommendations made by the transportation survey.

iv. The Project would consist of the first three years of the Program and the proposed credit would finance the foreign exchange component of priority requirements in this period. These requirements are hopper cars for coal, which constitutes KNR's principal freight traffic; tank cars for oil, which is a rapidly increasing traffic; and consulting services. The coal and oil cars are being procured under international competitive bidding in accordance with the Association's requirements.

v. The management of KNR is generally satisfactory, but provision is made in the Project to correct some organizational and staff deficiencies. The maintenance of property is also generally satisfactory except for older rolling stock for which recommendations are made. Operational efficiency is improving and is acceptable. For the last ten years freight and passenger traffic has been increasing sharply; further increases are expected during the period 1967-1971 at 11% for freight and 8% for passengers per annum.

vi. Because of the overall low level of tariffs, the rate of return has, so far, been inadequate. Measures to strengthen the financial situation of KNR are included in the Project and are expected to result in the achievement of a satisfactory rate of return.

vii. The Project is justified on economic grounds. It would ensure the continued and expanded operation of KNR which, as the principal transport mode, is essential to the economic needs of the country. The IDA-financed part of the Project would yield an economic return of 20%; the other project items are also expected to achieve satisfactory

returns although it has not been possible to quantify all of them individually.

viii. The Project is suitable for an IDA credit of US$ 11 million equivalent to the Government of the Republic of Korea, to be made available to KNR at 6% rate of interest for a term of 25 years, including a three-year period of grace.

KOREA

APPRAISAL OF A SECOND RAILROAD PROJECT

1. INTRODUCTION

1.1 The Government of the Republic of Korea has asked the Association for a credit of US$ 11 million equivalent to help finance part of the foreign exchange cost of the Korean National Railroad's (KNR) Development Program, which is part of the Second Five-Year Economic Development Plan, 1967-1971, of Korea. The KNR Program is to modernize and expand capacity, mainly by: the construction of new lines and the relaying of old lines in heavier track material; the building of marshalling and reception yards and the provision of improved signalling; the equipping of workshops; the procuring of additional more powerful locomotives; and the procuring and manufacturing of additional higher capacity rolling stock. The cost of the Five-Year Program is estimated at 57 billion Won (US$ 215 million equivalent),of which, 39 billion Won (US$ 147 million) is in local currency and 18 billion Won (US$ 68 million) in foreign exchange. The Project would comprise the first three years of the Program, from 1967 to 1969. The credit would finance the purchase of 600 hopper cars for coal, 450 tank cars for oil and the employment of consultants; all of these are priority requirements within the Project.

1.2 This report is based on the findings of an IDA mission, consisting of Messrs. Mackay, Chapman and Parthasarathi, which visited Korea in April, 1967, and on information provided by KNR and the Government of Korea. Messrs. Brandreth and De Gryse of the Association also contributed to the preparation of the report.

1.3 In 1962 IDA lent $14 million (Credit 25-KO) to the Government of Korea to finance KNR purchases of passenger cars and coal cars and to engage consultants to establish a sound accounting and statistical system; disbursements were completed by December 31, 1965. These purchases and services were part of KNR's First Five-Year Development Program, 1962-1966, which was originally estimated to cost 17.15 billion Won. The Program was revised in 1964 to 35.7 billion Won, to allow for faster increases in traffic and prices than had been estimated. The passenger cars and coal cars are all in service, are technically satisfactory and are being well-maintained. There is a problem of appropriate unloading facilities for the coal cars which is currently receiving attention. A modern accounting system has been installed and is working satisfactorily. The production of statistics is copious but still requires improvement (see Annex). The Development Program, 1962-1966, as revised, was 80% completed by the end of 1966.

1.4 In 1965, the Government of Korea appointed consultants (BCEOM/SOFRERAIL, French, cooperating with NEDECO, Dutch) to carry out an integrated transportation survey for the entire country and all modes of transport. The foreign exchange cost of this survey of US$ 388,000 equivalent was financed under IBRD technical assistance.1/ The survey was completed in 1966. It provided data and made recommendations which, inter alia, were useful to KNR and to the Government in drawing up KNR's Development Program 1967-1971.

1/ President's Letter R65-147 of Sept. 13, 1965.

2. BACKGROUND

Geography and Population

2.1 The Republic of Korea constitutes the southern half of the Korean peninsula below the 38th parallel of latitude. With an area of 98,430 km^2 it is about the size of Portugal.

2.2 The population in 1966 was about 29 million, representing a density of 295 persons per km^2, higher than that of Japan (262) but less than that of Taiwan (336). In the recent past the population growth has come down somewhat from the previous high rate of about 2.9% a year. Over 10% of the country's population is concentrated in the capital city of Seoul.

The Korean Economy

2.3 Agriculture constitutes the most important sector, contributing about 35% of the GNP and providing the livelihood of about 58% of the population. Mining and manufacturing account for 21% of GNP (11% of population). Per capita GNP in 1966 was about US$ 125 equivalent, about one-eighth of the level of Japan.

2.4 During the past ten years, the output of the economy grew 7% a year on the average, accelerating during the First Five-Year Plan (1962-66) to an annual rate of about 8.5%. The Government has launched a Second Five-Year Plan (1967-71) with a target of a 7% annual growth; a Bank economic mission last year considered this growth rate attainable (see Report No. AS-116 - Appraisal of Korean's Second Five-Year Plan). Since then, the economy has recorded a growth of 12% during 1966, and a growth rate of 8% in the next four years is now considered quite feasible and has been accepted for railroad planning by the Association in agreement with the Government.

Transportation Sector

2.5 At present, inland transport requirements in Korea are concentrated in a triangle formed by Seoul in the northwest, the coal-mining areas in the northeast and Pu San, the country's largest port in the southeast. These three areas are connected by the Korean National Railroad. Road transport of freight and passengers is confined mostly to short-distance local and feeder traffic.

2.6 Tables 1 and 2 show the movement of both freight and passengers over all transportation modes in Korea since 1955. These indicate a quadrupling of freight handled (equal to a growth of 15% a year) and a tripling of passengers handled (11.5% a year). In spite of a rapid growth in traffic moving by road, the railroad continues its predominance, with 54% of the tonnage of freight, 82% of ton-km, 39% of passengers handled and 65% of pass-km.

2.7 At the end of 1965, Korea had about 28,100 km of highways, of which only a very small proportion, some 1,500 km, were paved. This

compared with a total length of about 26,600 km in 1955, of which only 640 km were paved, and reflects very slow progress in the improvement of the highway network. There were about 42,000 motor vehicles in Korea at the end of 1965 compared with 18,000 in 1956, a growth of 9% a year. The present fleet represents one vehicle for every 700 persons, one of the lowest ratios of the world. Since 1957, highway vehicles have carried more passengers than the railroad, but in terms of pass-km the railroad is predominant since long-distance passengers prefer to travel by train because of the poor condition of the road network. In freight movements, the railroad carries more tonnage and about eight times as many ton-km as the highways.

2.8 Coastal shipping is relatively unimportant for passenger movement, but accounts for about 6% of all freight handled, mainly coal, oil, ores and lumber.

2.9 Korea has a number of airports, of which eight are open to civilian traffic. Passenger movement by air has been growing rapidly but still accounts for less than 0.1% of persons handled by all modes. Freight transport by air is negligible.

Transport Coordination

2.10 Transport coordination problems in Korea have been minimal because of the overall shortage of transport and the fact that development of each mode has, so far, been geared to specific transport requirements. The aspect of coordination which is normally the most critical, road-rail competition, has not reached serious proportions as yet since the poor quality of the roads limits road services to short-haul movements with small capacity vehicles. At the same time, there have been restrictions on vehicle purchases arising from foreign currency limitations. The Second Five-Year Plan for road development provides for the proportion of paved to total road mileage to increase from about 6% in 1966 to 16% in 1971, with only limited new mileage. In these circumstances no drastic change is to be expected in road-rail competition in the near future.

2.11 However, certain problems in coordination,are beginning to appear. Where new areas of development are planned, a choice between transport modes must be made. Planned port improvements will benefit coastal shipping, making it more competitive with the railroad for long-distance bulk transport. The problems of user charges and taxation policies have been highlighted by the Bank-financed transportation survey (para. 1.4) which has pointed out that road users are paying much more than the cost of the services they receive. To this degree, road transport is penalized in comparison to the railroad, airlines and coastal shipping. The Government is aware of these problems and has recently requested Bank assistance for a study which, while primarily concerned with a review of highway organization and administration problems arising from the recent transportation survey, would also provide for detailed consideration of the administrative and legislative provisions required to implement a program of transport coordination. This request is currently receiving Bank consideration.

3. THE KOREAN NATIONAL RAILROAD

Organization, Management and Staff

3.1 Until 1963 KNR was an integral part of the Ministry of Transportation; it had no separate legal status or independent management. A requirement of the 1962 Credit Agreement was that the Borrower should establish and maintain the Railroad as a separate entity with an appropriate organization and powers. In 1963, under the Government Organization Law, an independent railway manager was appointed and KNR was established as a separate entity with its own budget and accounting. The revised organization of the Railroad is an improvement, but there is still an excessive degree of dependence on Government, in staff, financial and budgetary matters. The Government is aware of this position and has set up a committee to reorganize KNR as a public corporation or other autonomous entity by the end of 1969. It was agreed during negotiations that the action initiated by the Korean Government was desirable and that, whatever the eventual organizational solution, KNR should in the meantime be given more authority and flexibility of operation in certain defined areas which are referred to in paras. 3.5, 3.37 and 5.5.

3.2 A weakness in KNR management is the lack of senior qualified engineering, economic and accounting staff. The shortage of professionally qualified officers, which KNR should now alleviate by increased recruitment from the universities, and the size and complexity of KNR's Development Program, mean that consultants must be used extensively throughout the five-year period to make technical and economic studies before major investment decisions are made. A list of problems which should be studied and on which consultants should be employed is given in the Annex. It was confirmed during negotiations that suitable consultants will be appointed for these purposes.

3.3 The employment of qualified staff has been adversely affected by the substantially higher salaries paid by industrial and commercial enterprises. The wage level of lower grade staff has also been low. To correct this position KNR has embarked, at Government direction and in common with other Government enterprises, on a policy of doubling all wages and salaries in the three-year period 1966-1968. Increases of 30% 1/ were awarded as from January 1, 1966, and further increases of 30% 1/ were awarded as from April 1, 1967. These increases in expenditure have not yet been offset by any increases in rates and fares, a matter referred to later (paras. 3.26 and 5.1).

3.4 Even with the doubling of wages and salaries between 1965 and 1968 the ratio of staff costs to total costs (36%) is low in relation to other railways. However, although the necessity to increase wages and salaries is recognized, such quick escalation reduces the margin for later adjustments and the possibility of spreading the remaining increases of 40% 1/ due in 1968 over a longer period was discussed during negotiations. The Association was advised that commitments already made would allow of no change.

1/ Based on 1965 salary levels.

3.5 The number of permanent employees at the end of 1966 was 29,976, an increase of 3,660 or 14% since 1961. In the same period, traffic units, as measured in terms of pass-km and net ton-km of freight, increased by 59% and productivity per employee increased by 40%. The number of employees per 1,000 train-km is 0.93, which is the same as the Taiwan Railway, slightly higher than the Japanese Railways (0.75) and much better than most railways. There is scope, however, for further improvement through modernization and increasing mechanization. In addition to permanent staff, KNR is currently employing 5,450 temporary staff, of whom 3,410 are used in the workshops, largely for the construction of new passenger and freight cars and the rebuilding of old cars. KNR has been instructed by Government to give as many temporary staff as possible permanent status. It was agreed in negotiations that KNR would not give permanent employment unless there was permanent need and that, generally, KNR would contain the number of staff at levels consistent with maintaining or improving the existing levels of productivity.

3.6 In general, KNR staff display excellent discipline and industriousness. Relations with labor are satisfactory.

Railroad Property

(i) Railway Lines

3.7 KNR's network is relatively extensive. At the end of 1966 KNR operated 3,435 route-km of standard gauge (1.435 m) lines, and 126 km of narrow gauge (0.915 m) lines. The mainlines from Seoul to Pu San (443 km) and from Seoul to In Cheon (30 km) are double track; all other lines are single track. There are many sections in mountaineous areas: over 40% of the network has grades over 1%, there are long sections of 2.5% and some of 3%; there are numerous curves and 110 km of tunnels and 81 km of bridges.

3.8 The total length of track, including double track and sidings, is 5,049 km. 1,374 km is laid in 50 kg/m rails, 2,600 km in 37 kg/m rails and the rest in lighter rails. 17% of all rails are under 10 years old and 20% more than 30 years. All renewal of principal lines is now with 50 kg/m rails. With the growth of traffic and use of heavier diesel locomotives, further relaying is necessary and planned. Experiments are in process with long welded rails. Ties are mostly of imported hardwood, but since 1962 KNR has used concrete ties, manufactured in Korea, for renewal purposes and some 850 km of track are so equipped. Ballast is generally adequate. Considerable attention is paid to track maintenance and the condition of the track is good. The strengthening of some bridges is necessary and planned.

3.9 Signalling arrangements consist of color lights in the Seoul area and electric block instruments on main lines. Centralized traffic control (CTC) is being installed on the single line of heaviest traffic between Seoul and Bong Yang. Increasing traffic is creating capacity problems on other lines which will require signalling improvements. The communication system is satisfactory.

(ii) Motive Power and Rolling Stock

3.10 KNR's motive power and rolling stock position as at the end of 1966 is shown in Table 3. A summary is given below:

Motive Power	Number of Units
Steam	242
Diesel shunting	13
Diesel mainline	160
Diesel railcars	163
Passenger Car Stock	1,449
Freight Car Stock	11,039

3.11 In January, 1967, KNR received 17 additional mainline diesel locomotives and in the latter half of this year will receive 62 more, financed by USAID; these locomotives are from the 1962-1966 Program. With the acquisition of these diesels the remaining steam locomotives are to be phased out of service. The condition of the steam locomotives is poor and with impending replacement their maintenance is confined to the minimum. The condition of the diesel locomotives is good and they are well maintained. Excellent availability of about 97% has been sustained over the last few years. However, many of the diesel locomotives are now reaching the age when major overhauls are due and specific parts should be replaced. KNR has not been making adequate financial provision for the purchase of spare parts for diesel locomotives or for rolling stock generally and recommendations to deal with this problem are made in Section 4. At present the most powerful diesel locomotives are 1800 hp. With the progressive extension of heavier track and the strengthening of bridges (para. 3.8) new locomotives will be in the 2000 hp to 2400 hp range which will allow for increased train loads and/or speeds.

3.12 The diesel railcars are well maintained with availability of 86%; 88 of the railcars, or more than half the fleet, is less than two years old. The cars are of 360 hp but are mostly operated with two trailers and so have a low power-to-weight ratio. KNR agree with the transportation consultants' recommendation that further purchases of railcars should have increased unit power to permit better train schedules.

3.13 About 43% of all passenger cars are 25 years old or more, but 47% are less than 6 years old. The accommodation is comfortable. Largely because of the high percentage of older cars, which received intense usage during two wars, the availability of passenger stock (89%) is lower than desirable. The older stock is also unduly heavy and KNR plan replacement with lighter stock under the new Program to give better availability and operating performance.

3.14 Some 44% of the freight car stock is 25 years old or more. Present maximum capacity per car is 40 tons but average capacity is about 35 tons. The need for new cars of improved design and higher capacity is dealt with in Section 4. Availability of existing cars at 87% is low.

Two main factors preventing better performance are the poor design of axle boxes and the generally inadequate facilities provided for inspection and maintenance, including shortage of spares. The number of hot boxes is excessive. It was agreed in negotiations that to the extent practicable there should be renewal of axle boxes on existing cars, preferably with roller bearings, and that improved maintenance facilities, including better stocks of spares would be provided. The use of consultants to help KNR in these matters was also agreed.

(iii) Other Property

3.15 KNR's marshalling yard facilities are generally inadequate in relation to rapidly expanding traffic and the need to increase consolidated train load operations. So far, three major enlargements of general purpose yards are in hand - at Je Cheon (mainly for coal traffic) at Ga Ya (for Pu San) and at Su Saeg (for Seoul). More yards are planned and needed. Special yard facilities for the reception of coal traffic, particularly in the Seoul area, are also inadequate and coal hopper cars, designed for mechanical discharge, have to be offloaded mostly by hand. As a result, the turn-round of these special cars, which could be 2.5 days, is 4.5 days. To correct this deficiency, KNR has been building a specially designed reception yard at Rimoondong (for Seoul). The Government and the coal industry, however, are now having second thoughts about the whole complex problem of the reception, storage, manufacture (into briquettes) and distribution of coal in the Seoul area. The tonnages involved, seasonally peaked in winter, are some 4 million tons at present, rising to 6 million tons by 1971. It may be that two more yards will be built thereby altering the scale and functioning of Rimoondong. The Government now recognizes that the coal and briquette traffic in the Seoul area poses major problems; however, railroad operations are only one aspect of these problems and cannot be dealt with in isolation. It was agreed during negotiations that KNR, with the full support of the Government, would employ consultants to study and advise on this problem and that the Government would use its best efforts to obtain agreement among all parties concerned, including the coal industry and the City of Seoul, on the implementation and financing of the courses of action indicated to be appropriate by the study. It was further agreed during negotiations that the appointment of consultants for this purpose, satisfactory to the Association, was a matter of priority, and it has been made a condition of effectiveness of the proposed credit. It was further agreed that consultants would be employed by KNR to make a comprehensive review of the location, design and operation of all yards generally generally before further major expenditure was committed.

3.16 KNR has four main workshops, two in Seoul (at Yeong Deung Po and Yong San) and one each in Pu San and In Cheon. The Yeong Deung Po workshop, which is used largely for steam locomotives, is to be closed after dieselization is completed. The remaining three workshops should be adequate for all requirements, but much of the machinery is obsolete and worn out and is planned to be replaced.

3.17 Many KNR buildings, such as offices, stations and sheds, are old and too small for growing traffic requirements. However, they are well maintained and replacement and improvement cannot be accorded high priority in view of other urgent needs.

Operations

3.18 Table 4 gives a summary of operating statistics from 1961 to 1966. It shows that rapidly increasing traffic has been accompanied by improved operating efficiency. Traffic units per locomotive and per employee have risen progressively and pass-km per passenger car and net ton-km per freight car have also improved. Performance in these respects is good, but there are signs that under present conditions the limits of operating efficiency are being, or have been, reached: the average turn-round time of freight cars is static at 4.5 days; diesel locomotive availability, which is being held around 97% is excellent and cannot be improved; freight cars carry close to their effective capacity; and passenger cars frequently have occupancy of over 100%.

3.19 These figures indicate that increases in traffic must largely entail further investment to expand capacity. There is, however, also scope for better utilization of existing assets. Thus, improved maintenance of rolling stock (para. 3.14) and the proper handling of coal traffic (para. 3.15) should allow for a progressive reduction in car turn-round figures. Oil tank cars have a poor turn-round of 6.5 days. This is largely because of: a) slow discharge of military oil, b) the need to defreeze fuel oil in winter, and c) inadequate storage. The new tank cars proposed will allow defreezing en route. During negotiations it was agreed that Government would examine the provision of adequate storage by the oil industry and that KNR would apply increased demurrage charges on tank wagons as a deterrent to slow discharge.

Freight Traffic

3.20 Between 1955 and 1966 KNR's total freight traffic grew about 8% per year in tonnage and 9.5% in ton-km. This is almost entirely due to commercial traffic (as distinct from military and railway service freight) which grew 13.5% in volume and 14.5% in ton-km during the period. As a result, commercial freight now accounts for 87% of all ton-km, as against only 51% in 1955 (see Tables 5 and 6). Commercial traffic growth has slowed slightly in the past five years, but the rate has remained above 12% per year, which is still impressive.

3.21 Coal traffic increased from 1.3 million tons in 1955 to about 10 million tons in 1966 (over 20% per year) and now accounts for 40% of total freight tonnage. Cement traffic has increased at an even faster rate, in excess of 30% annually, to reach 1.7 million tons in 1966 (7% of total tonnage) while fertilizer, with an equal tonnage, has registered a growth rate of over 8% annually. With oil, grain, ore and timber movements making up another 14% of the traffic, bulk traffic constituted

70% of the total volume moved in 1966 and 83% of the commercial tonnage. In terms of ton-km, the basic bulk commodities of coal, cement, grain, oil and fertilizer constituted 57% of total traffic and 65% of commercial movements.

3.22 The average freight transport distance is 220 km, and has remained at about this level over the last several years. Although there are seasonal traffic peaks, for example, coal, the inadequacy of KNR capacity to meet all demands results in there being only small traffic fluctuations.

Passenger Traffic

3.23 Passenger traffic throughout the period 1955 to 1966 increased about 8% a year in both numbers and pass-km. Following an increase of 35% in passenger fares on January 1, 1965, passenger traffic declined during the year by about 6%, but has since recovered and resumed the normal growth pattern. The earlier passenger fare increase of 15% in 1964, however, had no adverse impact on the growth of passenger traffic.

3.24 Commuter traffic is relatively important although it is unconcentrated on the Seoul-In Cheon line. About one-fifth of the passengers and one-tenth of pass-km are accounted for by this traffic. Altogether, passengers travelling by third-class constitute 97% of the total, upper class passengers about 1.5% and military personnel the balance of 1.5%. The average distance travelled is about 62 km, 21 km in the case of commuters and 77 km for other passengers, and has not changed much in the last ten years.

Present Finances

Tariffs

3.25 Like all Government enterprises, KNR must have its tariffs reviewed by a rate-making committee before they are approved by the Government. The committee consists of the Deputy Prime Minister, who is Chairman, assisted by four ministers and ten other qualified individuals.

3.26 Tariffs are generally low and increases made during recent years have not fully offset increases in costs, arising mainly from devaluation and increases in wages and salaries. Under Credit 25-KO of August 17, 1962, agreement was reached to increase, on or before June 1, 1963, KNR's freight revenue by 25%; the increase was not granted but was replaced - with the concurrence of the Association - by an overall increase of 15% in both freight rates and passenger fares, effective January 1, 1964. Resultant additional revenue more than equalled that expected from the originally agreed 25% increase in freight rates only, but the seven months delay in applying the increase affected KNR's earnings. Rises in costs in 1965 were met by an increase of 15% in rates and of 35% in fares effective January 1, 1965, but further substantial increases in costs since then have not yet been offset by any tariff increases.

3.27 The freight rate structure is relatively simple with three classes for carload traffic (which accounts for over 90% of all freight) and three for less-than-carload traffic. In 1966, the average receipt per ton-km was only Won 1.11, lower than most railways in the world (equivalent to about US 0.67 cents per ton/mile), as compared with the average cost, including depreciation, of Won 1.26, as calculated by KNR. A request for a 20% increase in carload rates, to be effective July 1, 1966, was not approved by the Government. Proposals to improve the situation, agreed upon during negotiations, are described in the Section on "Future Earnings and Finances".

3.28 There are three classes of passenger fares, averaging Won 3.20, 1.62 and 0.81 per km. Substantial reductions, imposed by the Government, are granted to teachers and students (30%), armed forces and police (50%), and to student commuters (70%). The average receipt per pass-km in 1966 was only Won 0.97, lower than on most railways in the world (US 0.59 cents per passenger/mile), as compared with the average cost, including depreciation, of Won 0.93. This does not allow KNR to achieve a reasonable return on passenger traffic and measures to correct the situation are also described in the Section on "Future Earnings and Finances".

3.29 Independent of the tariff increases required to achieve a reasonable return on the investment, there is a need for the complete revision of KNR's tariff structure with a view to assess tariffs of individual traffics on relation to cost. KNR has embarked upon such a review but progress has been slow, due largely to the lack of qualified staff. A recent USAID loan makes provision for the appointment of experts to assist in this matter and the possibility of a study by the cost section of the U.S. Interstate Commerce Commission, on terms of reference prepared by the Association, is being pursued currently.

Operating Results

3.30 The income accounts for the years 1962-1966 are given in Table 7. Except for 1966, actual operating results compare favorably with the forecast prepared for the appraisal of Credit 25-KO. Summary figures are given below.

	Won Billion				
	1962	1963	1964	1965	1966
Operating Revenue	7.1	8.4	10.4	13.1	15.7
Working Expenses	4.8	5.6	7.7	9.6	13.3
Depreciation	2.0	1.9	2.1	2.0	1.6
Operating Expenses	6.8	7.5	9.8	11.6	14.9
Net Operating Revenue	0.3	0.9	0.6	1.5	0.8
Other Income (Loss)	0.1	(0.5)	0.6	0.2	0.3
Interest Charges	-	0.1	0.4	0.3	0.4
Net Income	0.4	0.3	0.8	1.4	0.7
Operating Ratio	96	90	94	89	95

The fluctuations of the operating ratio reflect the timing of the tariff adjustments agreed to by the Government. Interest and debt coverage ratios were adequate over the period. The depreciation allowance for 1966 was about 10% of gross operating revenue and 3.6% of average gross depreciable fixed assets, which is reasonable; the revaluation of fixed assets presently underway (see para 3.33) will result in increased depreciation charges in the future.

3.31 Due to the absence of a record of properly identified and valued fixed assets, it has not been possible to measure KNR's rate of return before 1965. Rates of 2.5% and 1.5% were achieved in 1965 and 1966, respectively; they are inadequate and the proposals made later in this report aim to increase substantially the return on KNR's investment.

Financial Position

3.32 KNR's balance sheet as of December 31, 1965 and 1966 is shown in Table 8, and summarized below.

	Won Billion	
	1965	1966
ASSETS		
Net fixed assets (including work in progress)	70.1	79.5
Current assets	5.2	7.0
Other assets	2.8	2.7
Total Assets	78.1	89.2
LIABILITIES		
Current liabilities	2.5	4.9
Allowance for modernization	-	0.6
Long-term debt	5.2	11.9
Equity (including retained earnings)	70.4	71.8
Total Liabilities	78.1	89.2

3.33 As indicated in para. 3.31, the physical identification and valuation of KNR's fixed assets was not completed before 1965 and the first realistic view of KNR's finances was given in its balance sheet as of December 31, 1965. Gross fixed assets existing at December 31, 1962 were revalued at prices ruling at that date; those acquired subsequently were added at actual cost. In 1964, the Won was devalued by about 100%; the impact of this measure is to be taken into account in the revaluation of fixed assets as of December 31, 1966, which is presently underway. The procedures used in the revaluation, and the results thereof, will be checked by external auditors being appointed under the USAID loan already referred to in para. 3.29, whose report will be made available to the Association.

3.34 In 1966, KNR began to provide, in addition to normal depreciation, allowance for the increased costs involved in replacing existing facilities with more modern equipment. The 1966 provision is confined to steam locomotives and passenger cars; the revised forecasts for 1967 and onwards include provision for freight cars and other equipment.

3.35 The composition of the long-term debt as of December 31, 1966, is given in Table 9. The terms of the loans range from 15 to 25 years, with interest rates of 5-3/4 and 6%. The debt/equity ratio is satisfactory

3.36 The current ratio at 1.4/1 is low but adequate. At December 31, 1966, the liquid ratio dropped to 0.6/1, largely because of a substantial increase in accounts payable. The Government has agreed that it will enable KNR to maintain at all times an adequate liquid position; proposed increases in tariffs should result in more working capital becoming available to KNR from 1968 onwards (para. 5.9).

Budget, Accounts and Audit

3.37 Operating and capital budgets are prepared in two forms, one as laid down for Government Departments and the other based on the accounting system recently installed by the consultants financed under Credit 25-KO. Similarly, two sets of accounts are maintained because KNR, as presently constituted, cannot abandon the Governmental budgetary and accounting rules and regulations. The Government form of budget is too rigid and the Director-General of KNR has no power to reallocate funds between sub-heads of account, such adjustments being authorized only by the Minister of Finance. Arrangements have been introduced recently whereby immediate action is taken to reallocate amounts in the budget from one item to another on request by the Director General of KNR. This will suffice until KNR is constituted into a corporate or other legal entity divorced from Government rules and regulations.

3.38 The consultants appointed under Credit 25-KO have prepared a performance budget system which, under the present set-up, cannot be used by KNR. Should the latter be constituted into a corporation or other more autonomous legal entity, it should make use of the performance budget system, possibly at first in a more simplified form, and assurances in this respect were obtained during the negotiations.

3.39 The modern commercial accounting system installed by the same consultants is working reasonably well, but there is a need to revise some of the accounting classifications in order to facilitate costing of individual traffics and to readily ascertain major costs. Accurate and meaningful statistics, essential for the production of traffic costs and for management control, are not readily available due (a) to divided control of their preparation by the traffic and accounts departments and (b) to compilation still being performed manually. KNR is currently studying both problems and will also obtain the assistance of consultants (see Annex).

3.40 External audit is carried out by the Ministry of Finance to confirm that expenses have been properly authorized and are in accordance with the approved budget. As a result of negotiations for Credit 25-KO, KNR since 1965 has a second set of accounts, kept in accordance with principles of commercial accounting; these accounts have not so far been audited. However, in connection with the recent USAID loan, the Government undertook to engage a suitable accounting firm to examine KNR's commercial accounts for 1966 and to report upon the adequacy of its accounting procedures. Negotiations with U.S. accounting firms have been protracted and the appointment is only now being finalized: it is on the basis that the firm appointed will make a partial audit for 1966, which will include a review of the income statement, and a full audit for 1967. The auditor's reports will be made available to the Association. As for the future, it has been agreed during negotiations that KNR will have its commercial accounts audited annually by an independent auditor acceptable to the Association promptly after the end of each fiscal year and will promptly furnish to the Association copies of such reports.

4. THE PROJECT

The 1967-1971 Development Program

4.1 The transportation survey made by consultants in 1965/66 recommended a KNR development program for the period 1967-1971 of 65 billion Won (US$ 245 million equivalent), with a foreign exchange component of US$ 77 million equivalent. The Government and KNR accepted this program with some variations in detail but none in total. The Association also accepts the main features of the Program but considers that it is in excess of the technical and financial capacity of KNR and could be reduced, without adverse consequences, to a total of 57.4 billion Won (US$ 217 million equivalent), of which, the estimated foreign exchange component would be US$ 68 million equivalent. Agreement was reached during negotiations on this program amount and on its contents, details of which are given below and in Table 10. In addition, work carried over from the 1962-1966 Program, to be completed in 1967, is estimated to cost 6.2 billion Won (US$ 23 million equivalent). Thus, the total investment for the period 1967-1971 amounts to 63.6 billion Won (US$ 240 million equivalent).

(1) Construction of new lines (11% of total expenditure). Five lines of a total length of 154 km: two lines totalling 36 km are to serve coal mines; two lines totalling 38 km are to serve and interconnect developing industrial areas; and one line of 80 km, between Jin Ju and Sun Cheon, begun under the 1962-1966 Program will be completed to improve access from the west of Korea to the main port of Pu San.

(2) Increase in station and line capacity (17% of total expenditure). Heavy increasing traffic requires the extension of

station and other facilities in the Seoul area; the provision of marshalling yards at key junctions; the improvement of loading and unloading facilities at many stations and freight yards; and the installation of signalling and track extensions.

(3) Way and structure renewals and improvements (10% of total expenditure). 37 kg/m rails are to be replaced by 50 kg/m rails to permit the extended use of heavier and more powerful diesel locomotives; wooden ties are to be renewed by concrete ties; old bridges are to be strengthened; and mechanical maintenance equipment is to be brought increasingly into use.

(4) Motive power and rolling stock (52% of total expenditure). 51 diesel locomotives, 97 diesel rail cars and 1,800 freight cars to be procured overseas. 755 passenger cars and 3,819 freight cars to replace overage uneconomic stock and to provide additional capacity, to be built locally.

(5) Rolling stock equipment and construction (7% of total expenditure). Increases in motive power and rolling stock require the improving of maintenance sheds and workshops; the replacement of obsolete equipment; the provision of additional machinery and plant; and the purchase of adequate spares, mainly from overseas.

(6) Miscellaneous (3% of total expenditure). Includes improvements to communications, office mechanization and consulting services.

4.2 The specific changes in the Government/KNR Program which were agreed in negotiations are:

(1) Slowing down of track relaying and improvements to some 70% of the work proposed. This is more consistent with past performance by KNR of this type of work which is adversely affected by heavy traffic density and severe climatic conditions.

(2) Deferring of major remodeling of the railroad layout at Ul San, mainly for city planning purposes.

(3) Rephasing over a longer period of large scale engineering works, mainly in the heavily built up Seoul area.

(4) Exclusion of luxury items, such as special sleeping and observation cars.

(5) Increased provision for consulting services in specific areas. Outlines of the services to be provided are in the Annex.

(6) Increased provision for the purchase of spares required to maintain or improve availability of locomotives and rolling stock.

(7) Carrying over of some expenditure on equipment purchased in the last year of the Program period.

4.3 In addition to the Program, KNR had planned to carry out 14 billion Won (US$ 53 million equivalent) of "Non-Program" investment in the same period – 5.75 billion Won for six new railroad lines totalling 473 km and 8.25 billion Won for transferring the Yong San workshops in Seoul to Dae Jeon. With regard to the new lines, details of the various proposals are given in Table 11, and locations are shown on the map. The program lines are related to known heavy traffic development or to economies in operation. The non-program lines are for the most part promotional and political and have not been the subject of adequate economic feasibility studies. As the KNR program by itself is as large as KNR can hope to finance, and in view of the need to establish effective coordination policies between road and rail (para. 2.11), it has been agreed that further work on the non-program lines will be postponed until coordination machinery has been set up by the Government, adequate engineering and economic feasibility studies have been made, and the Association is consulted. With regard to the removal of the Seoul workshops to Dae Jeon, this is unnecessary at present for KNR purposes and agreement to postpone the proposed work was obtained in negotiations.

4.4 The transportation survey identified seven existing lines which are not yielding revenues sufficient to cover costs. KNR will use consultants to review the economics of these lines in detail, with a view to reaching agreement with the Association on an appropriate program of action.

Description of the Project

4.5 The Project consists of the first three years of KNR's Development Program, 1967-1971, as revised above. The total cost of the Project, excluding the 6.2 billion Won carried forward from the 1962-1966 Program, is estimated at about 36.3 billion Won, equivalent to US$ 137 million, with a foreign exchange component of about US$ 40.3 million equivalent of which US$ 11.0 million would be provided by the proposed credit. The principal items in the Project are described briefly below:

	---Estimated Cost (in millions)---			
	Local	Foreign		Total
	Won	Won	U.S.$ equivalent	Won
I. Items to be financed by the proposed credit				
600 hopper cars	72	1,444	5.451	1,516
450 tank cars	54	1,263	4.765	1,317
Consulting services	30	132	.500	162
	156	2,839	10.716	2,995
Contingencies (3%)	16	76	.284	92
Sub-Total I	172	2,915	11.000	3,087

	---Estimated Cost (in millions)---			
	Local	Foreign		Total
	Won	Won	U.S.$ equivalent	Won
II. Other Items				
Construction of new lines	4,168	972	3.669	5,140
Increase in station and line capacity	4,648	509	1.920	5,157
Way and structure renewals and improvements	2,056	1,038	3.912	3,094
Motive power and rolling stock	11,221	2,674	10.084	13,895
Rolling stock equipment and construction	678	1,709	6.449	2,387
Miscellaneous	326	170	654	496
	23,097	7,072	26.688	30,169
Contingencies (10%)	2,309	708	2.669	3,017
Sub-Total II	25,406	7,780	29.357	33,186
TOTAL (I and II)	25,578	10,695	40.357	36,273

A breakdown of "Other Items" is given in Table 10.

4.6 The Project is of the right order of magnitude and generally well-conceived in relation to rapidly expanding traffic requirements and KNR's financial and technical resources. KNR has agreed to consult with the Association before incurring any substantial capital expenditure outside the Program.

4.7 The items to be financed by the proposed credit are all high priority requirements. The 600 hopper cars are to carry coal which constitutes some 40% of all freight traffic and is conservatively estimated to increase from 10.0 million to 12.6 million tons during the Project period. The provision of the hopper cars, however, must be accompanied by the provision of appropriate coal offloading facilities, particularly at Seoul (para. 3.15). Until these facilities are improved, the hopper cars cannot be used to full advantage. As indicated in para. 3.15 KNR will employ consultants to report on this matter and the Government will support effective follow through action.

4.8 The 450 tank cars (out of a total of 500 planned to be imported during the Project period) are required to meet an anticipated growth in oil traffic. The existing refinery at Ul San has been enlarged this year and a second refinery at Yeo Su is expected to come "on stream" in 1969. In 1966, 700,000 tons of oil were carried by 952 tank cars. In 1969, an estimated 2,040,000 tons are to be carried by 1,769 tank cars. Present tank car operations are not satisfactory (para. 3.19) and the new cars with 25% higher net load capacity (from 40 to 50 tons), with facilities to defreeze oil enroute and with better design giving better turn-round, would be expected to double present performance in ton-km, which would then be adequate. Pipelines will not be used in connection with the two named refineries but may be considered for a third refinery, if built, in the In Cheon-Seoul area.

4.9 The service of consultants would be used as indicated in the Annex to help KNR reach the most economical solutions to coal handling problems in the Seoul area; to advise on new marshalling yards; to help with rolling stock maintenance and repair problems; to advise on the design of new rolling stock to be purchased from overseas and to be built locally; and to review the economics of and recommend appropriate action for uneconomic lines. In addition, there are important traffic costing and statistical studies currently scheduled to be carried out under a USAID loan agreement (paras. 3.29, 3.39 and 3.40). The Association is maintaining contact with USAID on the status and scope of these studies; the amount provided for consultants under the proposed credit would allow of some assistance with the foreign exchange cost should this prove necessary.

4.10 The estimated cost of the hopper cars and tank cars has been adjusted on the basis of quotations received and orders placed in India in September (para. 4.13). The cars will be imported largely assembled and ready for use. Local costs include port charges and fees and some assembly and painting costs. The estimates are reliable and the contingency provision, making allowance for possible financing of consulting services, is considered sufficient.

Financing of the Project

4.11 Investment during the Project period, 1967-1969, including expenditure carried forward from the 1962-1966 Program, would amount to 42.5 billion Won (US$ 160 million equivalent) to be financed 56% out of internally-generated funds and 44% from borrowing; details of the financing plan over the Project period (1967-1969) and the Program period (1967-1971) are in paras. 5.6 and 5.7 and in Table 13.

4.12 The proposed credit provides for the foreign exchange component cost of the hopper cars, tank cars and consulting services, which represents only a small portion (6%) of the Project. If there are savings in the IDA-financed items, it is proposed that these be used to finance the foreign exchange component cost of additional project items to be determined in agreement with KNR.

Execution of the Project

4.13 KNR is competent, with the help of consultants, to carry out the Project. Because of the urgency to meet the traffic needs, the Government of Korea authorized, at its own risk, KNR to issue invitations to bid for both the hopper cars and tank cars on an international competitive basis, in May, 1967. The procedure was satisfactory to the Association, which reviewed the tender documents. At the request of the Association, KNR also employed consultants to advise on the designs and specifications for both types of car. The Government and KNR hope that delivery of the cars might be achieved in the first quarter of 1968. It is expected that no payments will be made before the date of the proposed Credit Agreement and that progress payments should be scheduled as follows:

Items	Up to Dec. 1968 (US$ million	Up to Dec. 1969 equivalent)	Total
Hopper cars	4.90	0.55	5.45
Tank cars	4.30	0.47	4.77
Consulting services	0.30	0.20	0.50
Contingencies			0.28
	9.50	1.22	11.00

5. FUTURE EARNINGS AND FINANCES

Tariffs

5.1 As indicated in paras. 3.26 to 3.28, the present overall level of tariffs is very low and insufficient for KNR to achieve a reasonable rate of return on its investment. The Government agrees and proposes increases of 30% in freight rates and 50% in passenger fares to be effective on or before January 1, 1968. These increases will still leave KNR charges among the lowest of any railroad which has been the subject of Bank/Association lending. The rather smaller increase in freight rates reflects the Government's wish to keep freight transportation costs as low as possible. It is not expected that the increase in freight rates will have any appreciable effect on the growth in traffic. The increase in passenger fares is comparatively steep and public reaction may result in a fall in traffic in 1968, but the upward trend in passenger traffic is reasonably expected to resume in 1969.

Forecast Operating Results

5.2 A detailed operating income and expenditure forecast 1967-1971 is given in Table 12. It reflects the above tariff increases and possible effects on traffic. It also takes into account substantial rises in wages and salaries to be applied in 1968, and the cost of moving the growing traffic expected over the period; on the other hand, the forecast makes allowance for economies resulting from complete dieselization and from other measures to improve efficiency which are recommended in this report. Gross operating revenue is expected to rise from 15.7 billion Won in 1966 to 34.2 billion Won in 1971, an average annual increase of 23%, while operating expenses, including provisions for depreciation and modernization, would increase from 14.9 billion Won in 1966 to 25.8 billion Won in 1971, an average annual increase of 14%. In 1971 the allowances for depreciation and modernization would together be some 17% of gross operating revenue. KNR has based the allowances on the tentative results of the revaluations of assets recently undertaken which is yet to be agreed with the auditors being appointed under the recent USAID loan (para. 3.33). KNR has agreed that depreciation will be based on the replacement value of all depreciable fixed assets and their useful life calculated in accordance with sound accounting principles.

5.3 The following is a summary of operating revenue and expenditure forecasts during the period 1967-1971.

	Won billion				
	Gross Operating Revenue	Working Expenses	Cash Surplus	Depreciation and Modernization Provisions	Net Operating Revenue
1967	20.4	14.4	6.0	3.5	2.5
1968	27.1	15.8	11.3	4.0	7.3
1969	30.0	17.3	12.7	4.6	8.1
1970	32.0	18.7	13.3	5.5	7.8
1971	34.3	19.8	14.5	6.0	8.5

The operating ratio, which was 95 in 1966, is expected to improve to 73 in 1969, at the end of the Project period, and to be 75 in 1971, at the end of the Program period. Interest ratios, between 3.1/1 and 5.3/1, and debt coverage ratios, between 4.2/1 and 5.5/1, assessed in accordance with assumptions explained in para. 5.8, are both satisfactory.

5.4 The rate of return on average net fixed assets in use should improve from 1.5% in 1966 to 4.8% in 1968 and 5% in 1969. During negotiations it was agreed that a return of 6% should be reached by 1971 calculated on the audited valuation of the fixed assets.

5.5 The operating income forecasts described in para. 5.2 do not provide for possible increases in costs beyond 1968. It was agreed during negotiations that should this occur and KNR be in danger of failing to achieve the agreed rates of return, KNR should propose, and the Government should approve, the necessary measures, including tariff adjustments, promptly to correct the situation. It is not possible now to quantify specific provision in amount for tariff increases after those of June 1968. Before this can be done it will be necessary for the review of the revaluation of fixed assets (para. 5.2) to have taken place and to know the results of the review of costs and tariffs (3.29) which should in itself result in some increases of rates and fares. As indicated in the preceding paragraph, the Government has agreed to a rate of return of 6% by 1971, and it would take such measures, whether by tariff increases or otherwise, as may be necessary to assure the timely fulfillment of this undertaking.

Forecast Cash Flow

5.6 The estimated cash needs and sources of funds required by KNR over the period 1967-1971 are detailed in Table 13; they are summarized below for the Project period (1967-1969) and for the Program period (1967-1971):

			(Won billion) 1967-1969		1967-1971
Funds Required					
Capital Investment			42.5		63.6
Debt Service			6.8		14.2
Total			49.3		77.8
Funds Available					
Internally-generated funds			33.3		58.2
Borrowing:					
Foreign - Existing loans			8.1		8.1
Proposed loans	- O.E.C.F. (Japan)	4.0		6.9	
	- I.D.A. Credit	2.9		2.9	
	- Other	1.9		6.2	
			8.8		16.0
Local - Existing loan			1.7		1.7
S/total Borrowing			18.6		25.8
Total			52.0		84.0

5.7 For the period 1967-1971 cash generated from operations, 58.2 billion Won, together with a loan of 1.7 billion Won from the Korean Reconstruction Bank, would cover debt service (14.2 billion Won) and finance all local currency costs of capital investment (39.5 billion Won). Cash resources at the end of the period would be increased by 6.2 billion Won. Of the foreign exchange costs (24.1 billion Won), 8.1 billion Won would come from existing foreign loans and 2.9 billion Won from the proposed IDA credit, leaving 13.1 billion Won to be secured. KNR expects to obtain 6.9 billion Won from Japan and 6.2 billion Won from other sources. Subject to reasonable lending conditions, borrowing of such magnitude is within the repayment capacity of KNR and the financial plan described above is suitable.

5.8 The cash flow has been prepared on the assumption that the borrowing to be secured would be on terms ranging from 15 to 25 years, including a three-year period of grace, with an overall interest rate of 6% p.a. Likewise, the proposed IDA credit is assumed to be made available by the Government to KNR for a term of 25 years, including three years of grace, also at 6% interest. No allowance has been made for the financing of "non-program" items (para. 4.3). The Government has agreed that in the event the expected foreign and local loans cannot be obtained on reasonable terms, it will make available to KNR, on terms and conditions satisfactory to the Association, all funds necessary to carry out the Project and the Program.

Forecast Balance Sheets

5.9 The forecast balance sheet position, 1967-1971, is given in Table 14 and is summarized below.

	(Won billion) 1967	1971
Net current assets	2	15
Net fixed assets	161	190
Other assets	2	2
Total	165	207
Modernization provision	2	7
Debt	21	31
Equity	142	169
Total	165	207

Although total debt is expected to increase by some 260%, from 12 billion Won in 1966 to 31 billion Won in 1971, the debt/equity ratio will not exceed 16/84 which is favorable. The current ratio will rise to almost 5/1 and the liquid ratio to 3.2/1, both of which are satisfactory.

6. ECONOMIC JUSTIFICATION

Introduction

6.1 Investments contained in the KNR's Development Program are primarily designed to increase capacity to meet rapidly growing traffic demands. Since most of the KNR's traffic consists of commodities such as coal, ore, oil, fertilizer and cement which are clearly rail-oriented and suited to the use of large freight cars and, often, consolidated train-loads, there is considerable scope for the purchase of more powerful locomotives, larger cars and heavier track. Such investments would help to modernize equipment and reduce operating costs.

6.2 The Development Program is part of Korea's Second Five-Year Development Plan (1967-71). It is based on the recommendations of a Bank-financed Transportation Survey which sought, inter alia, to establish the proper roles of the different transport modes in Korea. At the present time the railroad system provides the only network connecting all parts of the country with the large commercial and industrial centers of Seoul and Pu San. Natural conditions limit river transport and coastal shipping. The development of an adequate highway system capable of sustaining heavy traffic loads is handicapped by difficult terrain, and its completion is many years away. In these circumstances, development of the railway network is essential to the continued growth of the economy.

Traffic Forecasts

6.3 KNR expects freight traffic to grow about 11% per year during 1967-1971, with commercial traffic, as distinct from military movements and KNR service traffic, averaging a growth of over 12% annually. Passenger traffic should increase over 8% per year over the same period. These forecasts are somewhat higher than those calculated in the Transportation Survey and reflect a GNP growth of 8% annually during the Second Plan period, which is higher than forecast at the time of that survey. The freight traffic forecast corresponds closely with experience over the previous five years (1962-1966) while passenger traffic forecasts reflect the growth rate since 1955. They are considered reasonable.

6.4 Freight traffic is expected to grow from 5.45 billion ton-km in 1966 to 8.96 billion ton-km in 1971 (Tables 5 and 15). Passenger traffic is estimated to reach 13 billion pass-km in 1971, as compared with the 1966 level of 8.7 billion. Substantial amounts of additional equipment will be required to handle these increased quantities although much emphasis will be placed on larger and more efficient equipment.

Motive Power Requirements

6.5 Dieselization of the KNR will shortly be complete; delivery of 79 main line diesels in the current year will permit the withdrawal from service of 242 old steam engines by the end of 1968. The exceptional replacement ratio of 1 diesel for 3 steam locomotives (as against a more usual ratio of 2 to 5) indicates an economic rate of return higher than the 12% - 15% usually associated with dieselization. It is made possible by the purchase of powerful diesels to cope with the difficult grades frequently encountered on the KNR system, in place of underpowered steam engines many of which have been used intensively through two major wars. The latest diesel purchases will also permit the redistribution of existing smaller diesels to shunting duties, with marked economy in utilization.

Rolling Stock

6.6 The KNR Development Program provides for 5,600 new freight cars, 4,200 for additional traffic and 1,400 for replacements. About 2,900 additional cars will become available during the Project period (1967-69), including 600 coal hopper cars and 450 tank cars to be provided under the proposed credit. All the new cars will have a capacity of about 50 tons, as against the current average capacity of 35. Additionally, technical improvements, such as roller bearings, are expected to yield a further 5% in availability. The increase in earning capacity (about 45%) and the reduction in maintenance costs should assure an economic rate of return close to 20% over a 25-year life span.

6.7 The 2,900 additional cars to be delivered through 1969 will not fully correct the present situation in which the KNR is unable to carry all the traffic offered; however, the supply is geared to the physical and technical limitations of KNR. By 1971, the supply of rail freight transport should be in balance with anticipated requirements.

6.8 The 600 50-ton coal hopper cars to be provided through IDA financing will, under present operating conditions, be sufficient to meet the additional coal traffic demand through the Project period (1967-69). With improved coal terminal facilities to be constructed over the next five years the productivity of the entire hopper fleet of 2,071 cars (1,471 on hand plus 600 under the Project) should increase sufficiently to ensure that by 1971 all major coal movements will move by mechanized hopper car, releasing gondolas for more suitable traffic.

6.9 Oil traffic is expected to more than double between 1967 and 1969, reaching 677 million ton-km in that year. The 500 50-ton oil tank cars to be imported, bringing the tank fleet total to 1,769, should provide ample capacity for this traffic. However, at present, KNR tank car utilization averages only 250,000 ton-km per year. New operating techniques should increase this to at least 400,000 ton-km by 1969 and higher levels thereafter to ensure adequate capacity at least until the end of 1971.

6.10 KNR plans to build 755 new coaches and ancillary vehicles locally during 1967-71 and scrap 200 which are 35 or more years old. The replacement cars will be only half the weight of the old vehicles, but have equal carrying capacity. Additionally, maintenance costs will be cut in half. This will result in greater train capacity, higher speeds and increased utilization. The economic rate of return will approximate 25% on the replacement coaches, even if benefits are limited to 10 years, representing the maximum remaining useful life which could be expected from the old vehicles if they were not replaced now. The new additional stock, badly needed to meet anticipated traffic demands, will yield an economic rate of return of about 16% over 25 years. Altogether, an increase of at least 48% in traffic capacity is expected, which is sufficient for the volume of traffic expected through 1971.

Way and Structure renewals and improvements

6.11 Investments in way and structures are largely concentrated in the replacement of existing worn 37 kg/m rail, laid in 10 m lengths, with 50 kg/m rail in 20 m lengths. This program is directly associated with the increasing use of heavier motive power and rolling stock. The present program will increase the proportion of 50 kg/m rail from 25% to about 40% by 1971.

6.12 The benefits accruing from the use of the heavier rail relate largely to the use of heavier equipment. Moreover, the 50 kg/m rail, while more expensive, is cheaper to maintain than 37 kg/m rail and

has a longer life. These advantages collectively yield an economic rate of return in excess of 10%. Since it is ultimately intended to convert the rails into long continuous trackage, an additional benefit will result from the fact that only half the number of welds will be required.

New Lines

6.13 Five new lines are to be constructed during the Program period, totally 154 km. All have been endorsed by the Transportation Survey as justifiable and consistent with highway development plans.

(a) Gyeong Jeon Line (80 km) was begun under the 1962-66 Program and is half complete. This line will reduce connections between Pu San and the southwestern area of the country by an average of 200 km.

(b) Jeong Seon Line (24 km) and (c) Mun Gyeong Line (12 km) - these are spurs to coal-mining areas scheduled to produce 0.6 and 1.3 million tons annually, respectively.

(d) Bi In Line (22 km) - also in the nature of a spur line to serve a new industrial area, and shorter distances for traffic in that direction.

(e) Jang Hang Line (16 km) - to provide a direct link between Bi In and the south and shorter distances for traffic in that direction.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 KNR's Development Program, 1967-1971, revised as recommended in this report and exclusive of "non-program" items, is generally well-conceived. Its implementation is of high priority for the economic development of Korea. The Project, which consists of the first three years of the Program, is technically, economically and financially sound. Cost estimates appear to be reliable and procurement procedures for the IDA-financed project items are in accordance with the Association's requirements.

7.2 In spite of some organizational and staff deficiencies, the management and operation of KNR are generally satisfactory and its financial position is expected to become satisfactory through the proposed rate and fare increases.

7.3 During negotiations, assurances were obtained from the Government and KNR on:

(i) Future organization and budgetary arrangements of KNR (paras. 3.1, 3.37 and 3.38);

(ii) Scope of consulting services (paras. 3.2, 3.14, 3.15, 3.29, 3.39, 4.7, 4.9 and Annex);

(iii) Staffing policies (para. 3.5), tariff increases (para. 5.1), targets for rates of return (para. 5.4) and Government financing (para. 5.8).

7.4 The Project would be a suitable basis for an IDA credit of US$ 11.0 million equivalent to the Government of Korea, to be made available to KNR at 6% interest for a term of 25 years, including three years of grace.

November 21, 1967

Table 1

KOREA

SECOND RAILROAD PROJECT

FREIGHT TRANSPORT BY MODE*

Year	Railroad**	Truck	Coastal Shipping	Total
(i) Million Tons				
1955	5.0	2.0	1.0	8.0
1956	5.6	3.3	1.0	9.9
1957	7.0	5.3	1.0	13.3
1958	7.3	5.7	1.2	14.2
1959	9.0	6.4	0.9	16.3
1960	10.2	6.7	1.0	17.9
1961	11.1	9.9	1.2	22.2
1962	13.1	11.0	1.6	25.7
1963	15.7	10.4	1.9	28.0
1964	16.8	12.2	2.2	31.2
1965	18.9	12.2	2.7	33.8
1966	20.3	N/A	N/A	N/A
(ii) Billion Ton-Km				
1955	1.06	0.10	0.20	1.36
1956	1.30	0.17	0.20	1.67
1957	1.61	0.27	0.20	2.08
1958	1.76	0.29	0.24	2.29
1959	2.15	0.32	0.18	2.65
1960	2.48	0.34	0.20	3.02
1961	2.70	0.30	0.24	3.24
1962	3.26	0.37	0.32	3.95
1963	3.61	0.41	0.38	4.40
1964	3.88	0.48	0.39	4.75
1965	4.43	0.48	0.39	5.30
1966	4.76	N/A	N/A	N/A

* Freight transport by air is negligible.

** Commercial freight only.

Table 2

KOREA

SECOND RAILROAD PROJECT

PASSENGER TRANSPORT BY MODE

Year	Railroad	Highways	Air	Coastal Shipping	Total
(i) Millions of Passengers					
1955	57.3	48.0	*	*	105.30
1956	66.3	53.0	0.04	*	119.34
1957	53.4	70.0	0.06	*	123.46
1958	70.1	72.0	0.05	*	142.15
1959	71.5	92.0	0.07	*	163.57
1960	75.7	105.0	0.07	4.0	184.77
1961	88.3	116.0	0.06	3.7	208.06
1962	100.6	139.0	0.05	4.4	244.05
1963	109.3	145.0	0.09	4.5	258.89
1964	118.5	180.0	0.18	5.9	304.58
1965	107.2	240.0	0.21	5.5	352.91
1966	138.0	*	*	*	*
(ii) Billions of Pass-km					
1955	3.71	0.90	0.01	0.10	4.72
1956	4.05	0.99	0.01	0.11	5.16
1957	3.43	1.31	0.02	0.11	4.87
1958	4.17	1.39	0.02	0.12	5.70
1959	4.54	1.79	0.02	0.14	6.49
1960	4.94	2.04	0.02	0.15	7.15
1961	5.37	2.24	0.02	0.14	7.77
1962	5.87	2.74	0.02	0.16	8.79
1963	6.68	2.89	0.03	0.18	9.78
1964	7.35	3.59	0.05	0.21	11.20
1965	6.92	4.80	0.06	0.21	11.99
1966	8.66	*	*	*	*

*Data not available.

SECOND RAILROAD PROJECT

Composition of Motive Power and Rolling Stock as at Dec. 31, 1966 through 1971 (excluding narrow gauge lines 1/).

	Actual	Forecast					1971 over 1966
	1966	1967	1968	1969	1970	1971	+ or -
1. Motive Power 2/							
Steam locomotives	242	140	70	-	-	-	-242
Diesel Shunting locomotives	13	44	47	49	52	56	+ 43
Diesel mainline locomotives	160	208	205	211	229	247	+ 87
Diesel railcar units	163	163	163	183	215	260	+ 97
Total (excluding steam)	336	415	415	443	496	563	+227
2. Passenger Car Stock 3/							
Passenger and sleeping cars	1,283	1,308	1,411	1,507	1,602	1,682	+399
Mail & baggage cars	115	145	157	170	183	196	+ 81
Heater vans	51	86	96	106	116	126	+ 75
Total	1,449	1,539	1,664	1,783	1,901	2,004	+555
3. Freight Car Stock 4/							
Box cars	4,113	4,772	5,022	5,542	5,712	6,032	+1,919
Gondolas	3,403	3,447	3,404	3,362	3,612	3,762	+ 359
Hopper cars	1,471	1,471	2,071	2,071	2,071	2,071	+ 600
Tank cars	952	1,169	1,669	1,769	1,769	1,769	+ 817
Others	1,100	1,234	1,214	1,194	1,393	1,591	+ 491
Total	11,039	12,093	13,380	13,938	14,557	15,225	+4,186

Notes: 1/ Narrow gauge lines: Su In (53 km) and Su Yeo (73 km). Steam operated. Retention requires study before any major investment.

2/ Motive Power: All additional mainline locomotives to be imported after 1968 to be larger, type 2000-2400 h.p. Present largest are 1826 h.p. Shunting locomotives to be provided i) by relegating existing SW8 and G8 locomotives (800 h.p. approx.) to these duties and ii) by purchase of 10 small shunting locos.

3/ Passenger cars, etc:

	1967-71
To be built locally	755
To be placed out of service	200*
Total additions	555

*350 cars scheduled to be scrapped but 150 will be rebuilt locally and retained.

4/ Freight cars:

	1967-71
To be built locally	3,819**
To be imported	1,800**
	5,619
To be placed out of service	1,433***
Total additions	4,186

**All imported cars and most new locally built cars to be 50-ton capacity. Present maximum 40 tons per car.

***2,500 scheduled to be scrapped but 1,067 will be rebuilt locally and retained.

Table 3

Table 4

KOREA

SECOND RAILROAD PROJECT

Summary of Operating Statistics (all traffic)

		1961	1962	1963	1964	1965	1966
I. TRAFFIC							
Pass-km	000,000	5,372	5,869	6,576	7,323	6,917	8,665
Net ton-km	000,000	3,486	3,977	4,358	4,522	5,044	5,450
Traffic unit	000,000	8,858	9,846	10,934	11,845	11,961	14,115
II. OPERATION							
TRAIN KM Steam	000	7,800	8,899	8,918	5,671	6,879	7,713
Diesel	000	11,100	11,613	13,149	16,275	17,002	17,924
Railcar	000	1,000	1,593	2,939	5,787	6,164	6,433
Total	000	19,900	22,105	25,006	27,468	30,045	32,070
ENGINE KM Steam	000	11,900	13,230	13,443	9,906	11,636	13,181
Diesel	000	14,000	13,949	15,546	19,116	19,088	21,208
Railcar	000	1,100	2,295	5,186	9,439	9,060	10,150
NUMBER OF ENGINES IN FLEET							
Steam		350	280	280	272	272	242
Diesel		95	95	125	125	125	173 1/
Railcar		18	31	81	80	77	163 2/
Total		463	406	486	477	474	578
ENGINE KM/ENGINE/DAY IN FLEET							
Steam		94	119	132	100	117	139
Diesel		402	403	341	419	417	428
Railcar		167	203	176	323	322	320
NUMBER OF ENGINES AVAILABLE							
Diesel		92	93	98	121	122	133 3/
Railcar		15	25	40	69	66	72 3/
ENGINE KM/ENGINE DAY AVAILABLE							
Diesel		411	410	455	433	431	436
Railcar		251	250	356	375	376	385
TRAFFIC UNIT/Engine Unit in Fleet	000,000	19.2	24.2	22.5	24.9	25.2	28.9 4/
PASS.KM /Train km		446	445	437	431	398	439
PASS.KM/Passenger car in fleet	000,000	4.9	4.5	4.1	5.8	5.0	6.2
/Passenger car/km		48.9	63.1	62.0	59.2	54.4	62.9
NET TON.KM/Freight car in fleet	000	370	407	416	422	476	519
Number of freight cars loaded	000	536	617	664	665	735	765
Average turn-around of freight cars	day	4.6	4.6	4.5	4.4	4.5	4.4
Average load of freight cars	ton	28.1	28.6	28.8	29.1	29.5	30.6
III. STAFF							
Number of permanent employees		26,316	27,570	26,218	27,639	29,548	29,976
Traffic unit	000/employee	336	357	417	428	405	471

1/ 48 locomotives delivered at varying times through 1966 gave equivalent of 10 additional locomotives in the full year.

2/ 1 railcar rebuilt. 85 railcars delivered at varying times throughout 1966 gave equivalent of 18 additional railcars in the full year.

3/ Figures must be related to explanatory notes 1/ and 2/.

4/ Divisor of 487 (257 steam + 135 diesel + 95 railcars).

KOREA

SECOND RAILROAD PROJECT

FREIGHT TRAFFIC

	Tons Transported (millions)				Ton-km (billions)				Average travel distance (km)
	Commercial Freight	Military Freight	Railroad Service Freight	Total	Commercial Freight	Military Freight	Railroad Service Freight	Total	
1955	5.0	4.0	1.4	10.4	1.06	0.81	0.18	2.06	198.7
1956	5.6	4.0	1.4	11.0	1.30	0.74	0.23	2.27	205.9
1957	7.0	3.7	1.3	12.0	1.61	0.75	0.21	2.57	214.0
1958	7.3	3.4	1.4	12.1	1.76	0.70	0.20	2.66	219.9
1959	9.0	3.2	1.5	13.7	2.15	0.66	0.26	3.07	223.0
1960	10.2	2.8	1.4	14.4	2.48	0.56	0.24	3.28	227.6
1961	11.1	2.9	1.4	15.4	2.70	0.55	0.24	3.49	226.7
1962	13.1	2.4	1.4	17.9	3.26	0.48	0.24	3.98	222.0
1963	15.7	2.3	1.8	19.8	3.61	0.46	0.29	4.36	220.4
1964	16.8	2.1	1.4	20.3	3.88	0.39	0.23	4.49	222.6
1965	18.9	2.1	1.4	22.4	4.43	0.39	0.23	5.04	224.0
1966	20.3	2.1	1.7	24.1	4.76	0.40	0.29	5.45	226.1

Table 5

KOREA

SECOND RAILROAD PROJECT

Analysis of Commercial Freight Traffic, 1955-1966
(millions of tons)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Coal	1.3	1.5	2.1	2.4	3.5	4.4	5.1	6.5	7.6	8.3	8.9	10.0
Fertilizer	0.7	0.7	0.7	0.7	0.7	0.8	0.8	1.3	1.1	1.0	1.8	1.7
Cement	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.9	0.8	1.1	1.5	1.7
Grain	0.4	0.4	0.4	0.4	0.4	0.6	0.5	1.0	1.3	1.2	1.1	1.2
Ore*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.4	0.4	0.6	0.6	1.0	1.0
Timber	0.4	0.5	0.6	0.5	0.6	0.4	0.3	0.3	0.4	0.4	0.4	0.4
Oil	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.6	0.7
Other	2.0	2.2	2.8	2.9	3.1	3.2	3.1	2.4	3.6	3.8	3.5	3.4
Total	5.0	5.6	7.0	7.9	9.0	10.2	11.1	13.1	15.7	16.8	18.8	20.1

Table 6

*For 1955-1960 included under "other".

KOREA

SECOND RAILROAD PROJECT

Summary Income Accounts 1962 - 1966 (Won billion)

	1962		1963		1964		1965		1966	
	Appraisal Forecast	Actual	Appraisal Forecast	Actual	Appraisal Forecast	Actual	Appraisal Forecast	Actual	Appraisal Forecast	Actual
Operating Revenue:										
Passenger	3.81	3.75	4.05	4.26	4.34	5.32	4.60	6.57	4.86	8.38
Freight	2.91	3.07	3.30	3.88	3.47	4.50	3.65	5.54	3.88	6.05
Other	0.10	0.28	0.11	0.25	0.12	0.55	0.13	0.98	0.14	1.27
Total Operating Revenue	6.82	7.10	7.46	8.39	7.93	10.37	8.38	13.09	8.88	15.70
Operating Expenses:										
Before Depreciation	6.20	4.83	6.39	5.63	6.20	7.71	6.15	9.60	6.42	13.39
Depreciation	0.97	1.97	1.07	1.90	1.13	2.05	1.20	1.99	1.27	1.53
Total Operating Expenses	7.17	6.80	7.46	7.53	7.33	9.76	7.35	11.59	7.69	14.92
Net Operating Revenue (loss)	(0.35)	0.30	.0	0.86	0.60	0.61	1.03	1.50	1.19	0.78
Non-operating Revenue (loss)	0.03	0.07	0.03	(0.50)	0.03	0.55	0.03	0.16	0.03	0.32
Net Revenue (loss) before interest	(0.32)	0.37	0.03	0.36	0.63	1.16	1.06	1.66	1.22	1.10
Interest Charges	0.01	0.006	0.10	0.02	0.35	0.35	0.32	0.29	0.30	0.37
Net Revenue (loss)	(0.33)	0.37	(0.07)	0.34	0.28	0.81	0.74	1.37	0.92	0.73
Operating Ratio	105	96	100	90	92	94	88	89	87	95
Times Interest Earned	-32.0	6.2	(-3.3)	18.0	1.8	3.3	3.3	5.7	4.1	2.9
Debt Coverage Ratio	13.0	50.9	3.8	17.4	2.2	5.6	2.9	7.1	3.3	4.3

Table 7

Table 8

KOREA

SECOND RAILROAD PROJECT

Summary Balance Sheets as of December 31

	W. millions	
	1965	1966
ASSETS		
Fixed Assets - Gross value	73,210	83,805
- Accumulated depreciation	7,957	9,485
Net Value	65,253	74,320
- Work in Progress	4,861	5,208
	70,114	79,528
Investments	100	100
Current Assets - Cash	417	176
- Inventories	2,682	3,910
- Deposits	573	841
- Prepayments	664	967
- Receivables	910	1,138
	5,246	7,032
Deferred Assets	2,688	2,539
Total Assets	78,148	89,199
LIABILITIES		
Equity - Fixed Capital	64,990	64,990
- Capital Surplus	2,292	3,104
- Earned Surplus	3,159	3,683
	70,441	71,777
Allowance for modernization	-	584
Long-Term Debt - Foreign Loans	5,161	10,002
- Korean Reconstruction Bank	-	1,871
	5,161	11,873
Current Liabilities - Accounts Payable	1,659	3,772
- Miscellaneous	887	1,193
	2,546	4,965
Total Liabilities	78,148	89,199
RATIOS		
Debt/Equity	7/93	14/86
Current Assets to Current Liabilities	2.1/1	1.4/1
Current Assets, less inventories, to Current Liabilities	1/1	0.6/1

Table 9

KOREA

SECOND RAILROAD PROJECT

Composition of Debt as of December 31, 1966

Class of Loan	Year Contracted	Total Amount (Won Million)	Repayment Period (Years)	Rate of Interest %	Outstanding (Won Million)
1. I.D.A. Relending (25-KO)	1962	3,759	25	5.75	3,351
2. U.S. AID I	1962	1,735	21	5.75	1,564
3. U.S. AID II	1965	2,614	21	5.75	2,145
4. U.K. (CTC)	1965	382	15	Current	
5. U.S. AID III	1966	5,078	16	5.75	
6. JAPAN (OECF) I	1966	3,276	20	5.75	2,942
7. JAPAN (OECF) II	1966	1,918	20	5.75	
8. KOREAN RECONSTRUCTION BANK	1966	3,571	25	6.0	1,871
		22,333			11,873

KOREA

SECOND RAILROAD PROJECT

Development Program - 1967-1971

Foreign Exchange: US$ thousand equivalent
Local currency: Won million
Total costs: Won million

Table 10

Items	Project 1967 $	1967 Won	1968 $	1968 Won	1969 $	1969 Won	Project Totals $	Project Totals Won	Project Totals Total Cost Won	1970 $	1970 Won	1971 $	1971 Won	Program Totals $	Program Totals Won	Program Totals Total Cost Won
Construction of new lines																
1. Gyeong Jeon	786	1,216	262	609		263	1,048	2,088	2,368					1,048	2,088	2,368
2. Jeong Seon		368	600	361	271	200	871	929	1,160		194			871	1,123	1,354
3. Mun Gyeong		103	200	220	100	256	300	579	659					300	579	659
4. Bi In			275	152	275	250	550	402	548		255			550	657	803
5. Jang Hang			500	110	400	60	900	170	405	400	60	400	60	1,700	290	741
Sub-totals	786	1,687	1,837	1,452	1,046	1,029	3,669	4,168	5,140	400	509	400	60	4,469	4,737	5,925
Increase in station & line capacity																
1. Seoul area	250	700	250	700	250	700	750	2,100	2,299	201	588	150	588	1,101	3,276	3,583
2. Marshalling yards 1/	350	280	350	280	350	280	1,050	840	1,118	300	280	224	280	1,574	1,400	1,800
3. Loading and offloading facilities	40	53	40	79	40	74	120	206	238	40	80	40	75	200	361	414
4. Building improvements & enlargements		66		112		66		244	244		222		214		680	680
5. Signalling & track extensions		474		437		347		1,258	1,258	214	350	220	450	434	2,058	2,174
Sub-totals	640	1,573	640	1,608	640	1,467	1,920	4,648	5,157	755	1,520	634	1,607	3,309	7,775	8,651
Way & structure renewals & improvements																
1. Track (bed, ties, rails)		606	1,585	604	1,583	604	3,168	1,814	2,654	1,583	604	1,583	604	6,334	3,022	4,700
2. Bridges	148	74	148	74	148	74	444	222	340	148	74	152	77	744	373	570
3. Equipment			150	10	150	10	300	20	100	158	10	152	20	610	50	210
Sub-totals	148	680	1,883	688	1,881	688	3,912	2,056	3,094	1,889	688	1,887	701	7,688	3,445	5,480
Motive Power & rolling stock																
1. Locomotives					1,400	48	1,400	48	419	3,540	70	5,040	74	9,980	192	2,836
2. Passenger cars	691	710	803	883	1,730	906	3,224	2,499	3,353	2,200	932	2,500	952	7,924	4,383	6,483
3. Freight cars	1,025	2,000	10,720	3,400	3,275	3,400	15,020	8,800	12,780	1,350	2,400	1,125	2,400	17,495	13,600	18,236
Sub-totals	1,716	2,710	11,523	4,283	6,405	4,354	19,644	11,347	16,552	7,090	3,402	8,665	3,426	35,399	18,175	27,555
Rolling stock equipment & construction																
1. Spare parts	650	26	650	26	650	26	1,950	78	595	650	26	650	26	3,250	130	991
2. Sheds, workshops, etc	310	200	2,012	200	2,177	200	4,499	600	1,792	828	200	400	200	5,727	1,000	2,518
Sub-totals	960	226	2,662	226	2,827	226	6,449	678	2,387	1,478	226	1,050	226	8,977	1,130	3,509
Miscellaneous																
1. Communications		49		68	75	68	75	185	205	75	67		28	150	280	320
2. Electric power & lighting		30		40		50		120	120		70		88		278	278
3. Office mechanization	65	1	25	1	279	1	369	3	101					369	3	101
4. Consultant services	150	16	250	16	250	16	650	48	220	250	16	230	16	1,130	80	380
Sub-totals	215	96	275	125	604	135	1,094	356	646	325	153	230	132	1,649	641	1,079
Total	4,465	6,972	18,820	8,382	13,403	7,899	36,688	23,253	32,976	11,937	6,498	12,866	6,152	61,491	35,903	52,199
Contingencies (10%)	447	897	1,882	738	1,340	690	3,669	2,325	3,297	1,194	650	1,286	615	6,149	3,590	5,220
GRAND TOTAL	4,912	7,869	20,702	9,120	14,743	8,589	40,357	25,578	36,273	13,131	7,148	14,152	6,767	67,640	39,493	57,419

1/ Includes doubling of 7 km of line between Bong Yang and Je Cheon marshalling yard.

KOREA

SECOND RAILROAD PROJECT

New Line Construction 1967 - 1971

PROGRAM

Financial Units: US$ = Thousands
Won = Millions

Name of Line	Terminal Stations	Length of Line (km)	Estimated Cost to completion Foreign (US$)	Local (Won)	Total (Won)	Date Work Began	Notes (including brief justification by KNR).
Gyeong Jeon	Jin Ju - Sun Cheon	80	1,048	2,090	2,368	Apr.'64	Will shorten connections of western areas with main port of Pu San.
Jeong Seon	Jeong Seon - Gu Jeol Ri	24	871	1,113	1,344	Jan.1966	0.6 million tons a year of coal.
Mun Gyeong	Bul Jeong - Mun Gyeong	12	300	579	659	May 1966	1.3 million tons a year of coal.
Bi In	Seo Cheon - Bi In	22	550	707	853	Apr.'66	New industrial area at Bi In
Jang Hang	Jang Hang - Gun San	16	2,100	343	900	Mar.'67	Direct link Bi In with south. Shortens transport coal from Ong Ma to Gun San by 225 km. Cost of bridge over river being shared with Government.
		154	4,869	4,832	6,124		

NON-PROGRAM

Kwang Ju	Kwang Ju - Dam Yang-	28				July '65	Agricultural products and passengers.
Gim Sam	Gim Cheon - Jin Ju	159				Nov.'66	To accelerate development.
Chung Nam	Non San - Seo Cheon	24				Dec.'66	Earthworks remain from Japanese occupation. Mineral, forests and strategic value.
Dong Hae Bug Bu	Dae Gin - Gang Reung	100				Dec.'66	To accelerate development.
Seo Hae An	Dae Ya/Gim Jae - Hag Geo	146				Apr.'67	Development of industrial and marine resources.
Bug Pyeong	Sam Wha - Mug Ho	13				Dec.'66	To accelerate development.
Industrial sidings		3				Apr.'67	To accelerate development.
		473					

Table 11

KOREA

SECOND RAILROAD PROJECT

Forecast Income Accounts 1967 - 1971

(Won Million)

	1967	1968	1969	1970	1971
OPERATING REVENUE					
Passenger revenue	11,099	14,629	16,595	17,636	18,760
Freight revenue	8,025	10,780	11,575	12,441	13,410
Other operating revenue	1,310	1,686	1,814	1,958	2,122
Total operating revenue	20,434	27,095	29,984	32,035	34,292
OPERATING EXPENSES					
Operating expenses before depreciation	14,406	15,839	17,258	18,730	19,787
Depreciation provision	2,571	2,866	3,351	3,995	4,383
Modernization provision	977	1,089	1,273	1,518	1,666
Total operating expenses	17,954	19,794	21,882	24,243	25,836
Net operating revenue	2,480	7,301	8,102	7,792	8,456
Non-operating revenue (net)	(61)	393	419	448	479
Net revenue before interest	2,419	7,694	8,521	8,240	8,935
Interest charges	770	1,462	1,797	1,893	1,923
Net revenue	1,649	6,232	6,724	6,347	7,012
RATIOS:					
Operating ratio	88	73	73	76	75
Times interest earned	3.1	5.3	4.7	4.4	4.6
Debt coverage	5.5	5.2	4.6	4.2	4.3
Return on average net fixed assets in use (%)1/	1.6	4.8	5.0	5.0	5.1

Table 12

Note 1/ : The value of net fixed assets in use is based upon preliminary figures of a revaluation carried out by K.N.R. as of December 31, 1966 which is to be reviewed in an independent audit that may result in changes.

KOREA

TABLE 13

SECOND RAILROAD PROJECT

FORECAST CASH FLOW STATEMENT 1967-1971

		1967	1968	1969	1970	1971	Total 1967-71
1. Investment Program:	Local Funds	7,869	9,120	8,589	7,148	6,767	39,493
	Foreign Exchange	1,302	5,486	3,907	3,480	3,750	17,925
	Total cost of Program	9,171	14,606	12,496	10,628	10,517	57,418
2. Ongoing Works		6,239	-	-	-	-	6,239
		15,410	14,606	12,496	10,628	10,517	63,657
TOTAL INVESTMENT COST							
3. Debt Service:	Interest on Loans	770	1,462	1,797	1,893	1,923	7,845
	Repayment of Loans	451	991	1,398	1,643	1,836	6,319
	Total Debt Service	1,221	2,453	3,195	3,536	3,759	14,164
4. Working Capital Increase (Decrease)		(617)	(22)	1,808	2,212	3,685	7,066
TOTAL FUNDS REQUIRED		16,014	17,037	17,499	16,376	17,961	84,887
FUNDS AVAILABLE							
1. Net Income Before Interest		2,419	7,694	8,521	8,240	8,935	35,809
2. Depreciation and Modernization		3,548	3,955	4,624	5,513	6,049	23,689
3. Sale of Assets		802	1,180	1,690	1,087	1,087	5,846
Sub-Total		6,769	12,829	14,835	14,840	16,071	65,344
4. Loans:							
i) Existing Foreign Loans:							
AID II (USA)		445					445
AID III (USA)		5,078					5,078
CTC (U.K.)		382					382
O.E.C.F. I (Japan)		334					334
O.E.C.F. II (Japan)		1,262	656				1,918
ii) Proposed Foreign Loans:							
O.E.C.F. (Japan		-	2,233	1,742	1,399	1,520	6,894
I.D.A. Credit		40	2,597	278	-	-	2,915
Other		-	-	1,887	2,081	2,230	6,198
Total Foreign Loans		7,541	5,486	3,907	3,480	3,750	24,164
iii) Local Loans:							
Korean Reconstruction Bank		1,700					1,700
TOTAL BORROWING		9,241	5,486	3,907	3,480	3,750	25,864
TOTAL FUNDS AVAILABLE		16,010	18,315	18,742	18,320	19,821	91,208
CASH AT BEGINNING OF YEAR		176	172	1,450	2,693	4,637	176
CASH AT END OF YEAR		172	1,450	2,693	4,637	6,496	6,496

KOREA

SECOND RAILROAD PROJECT

Pro-forma Balance Sheets as of December 31, 1967-1971

(Won Billion)

	1966 (actual) 1/	1967	1968	1969	1970	1971
ASSETS						
Fixed Assets:						
Land, buildings, machinery and equipment	166.30	181.06	194.63	205.59	215.28	224.86
Less depreciation allowance	17.48	20.05	22.92	26.27	30.27	34.65
Net fixed assets	148.82	161.01	171.71	179.32	185.01	190.21
Current Assets:						
Cash	.18	.17	1.45	2.69	4.64	6.50
Inventories	3.91	4.73	5.23	5.75	6.39	6.86
Other current assets	2.94	2.21	4.96	5.23	5.50	6.04
Total current assets	7.03	7.11	11.64	13.67	16.53	19.40
Investments	.10	.10	.10	.10	.10	.10
Deferred assets	2.54	2.39	2.24	2.09	1.94	1.79
TOTAL ASSETS	158.49	170.61	185.69	195.18	203.58	211.50
LIABILITIES						
Equity						
Fixed capital	64.99	64.99	64.99	64.99	64.99	64.99
Capital surplus	72.39	72.39	72.39	72.39	72.39	72.39
Earned surplus	3.68	5.33	11.56	18.28	24.63	31.64
Total equity	141.06	142.71	148.94	155.66	162.01	169.02
Allowance for modernization	.58	1.56	2.65	3.92	5.44	7.11
Debt:						
Foreign loans	10.00	17.09	21.59	24.09	25.93	27.85
Local borrowing	1.87	3.57	3.57	3.57	3.57	3.57
Total debt	11.87	20.66	25.16	27.66	29.50	31.42
Current liabilities	4.98	5.68	8.94	7.94	6.63	3.95
TOTAL LIABILITIES	158.49	170.61	185.69	195.18	203.58	211.50
RATIOS:						
Current assets to current liabilities	1.4	1.3	1.2	1.7	2.5	4.9
Current assets less inventories to current liabilities	0.6	0.4	0.6	1.0	1.5	3.2
Debt to equity	8/92	13/87	15/85	15/85	15/85	16/84

Note 1/: Including tentative results of revaluation of fixed assets, before auditing.

Table 14

KOREA

SECOND RAILROAD PROJECT

Traffic Forecasts For Principal Commodities 1967-1971

	1967		1968		1969		1970		1971	
	Tons	Ton-km	Tons	Ton-km	Tons	Ton-km	Tons	Ton-km	Tons	Ton-km
Grain	1,000	285	1,050	296	1,140	322	1,220	344	1,320	372
Fertilizer	1,000	250	2,000	494	2,200	535	2,410	576	2,410	576
Cement	2,000	545	2,520	683	3,570	967	4,430	1,173	4,520	1,228
Coal	10,500	2,200	12,000	2,450	12,570	2,527	12,970	2,555	13,460	2,598
Oil	900	298	1,800	670	2,040	677	2,040	677	2,040	677
Others (including imports)	7,640	1,865	8,620	1,900	9,440	2,250	10,670	2,500	13,060	2,800
Sub-total	23,040	5,443	27,990	6,493	30,960	7,278	33,740	7,825	36,810	8,251
KNR Freight	2,070	285	1,800	270	1,890	280	1,960	290	2,090	310
Military Freight	2,100	400	2,100	400	2,100	400	2,100	400	2,100	400
Total	27,210	6,128	31,890	7,163	34,950	7,958	37,800	8,515	41,000	8,961

Note: Tons in thousands
Ton-km in millions

Table 15

KOREA

SECOND RAILROAD PROJECT

EMPLOYMENT OF CONSULTANTS BY KNR

The list below describes those areas where consulting services are required during the Program period, 1967-71.

Statistics * All work is at present performed manually. The output is copious but uncoordinated and contains discrepancies. There is need for a study by consultants to examine and advise a) on the use of machines to process information; b) on the coordination of the production and presentation of statistics; and c) on the relation of statistics to individual traffic costs.

Traffic Costing * The tariffs need revision. The consultants should determine the current cost of individual freight and passenger traffics and assess future costs in the light of traffic forecasts, investment plans and other factors likely to affect operating and other costs, and establish from the resultant data a structure and level of tariffs. The consultants should also instruct the staff of KNR in the principles, processes and techniques of traffic costing and establish a system which the staff can maintain on a continuous basis for the future adjustment of rates and fares to reflect changes in expenditure levels and patterns of cost.

Coal Traffic ** Coal traffic has increased from 5 to 10 million tons in the last five years and is expected to rise to nearly 14 million tons by 1971. Some 30 to 40% of all coal moved by rail is consumed in the Seoul metropolitan area. The handling of this quickly increasing traffic causes many loading, offloading, storage and distribution problems. Among other problems mechanized coal hopper cars are improperly utilized. At the request of the Association, KNR had the rail aspects of the problem examined by consultants, SOFRERAIL. Recent Government and coal industry changes in plans have vitiated SOFRERAIL's proposals. There is need for a new and comprehensive study by consultants on behalf of all interests concerned - the Government, the coal industry, the city of Seoul and KNR - to ensure that the most economic and practical solutions are reached.

Rolling Stock The maintenance of existing rolling stock should be improved. Also the construction and rebuilding of rolling stock should be to better designs and specifications than are now available. So that KNR may have the advantage of most recent technical experience and advances, consultants should be appointed to advise a) on the maintenance and repair of existing rolling stock, with particular reference to repair facilities and repair programs, including the repair and/or replacement of existing axle boxes, and b) on the design of new and/or modified rolling stock to obtain higher net loads, lower tare weights and low annual maintenance costs.

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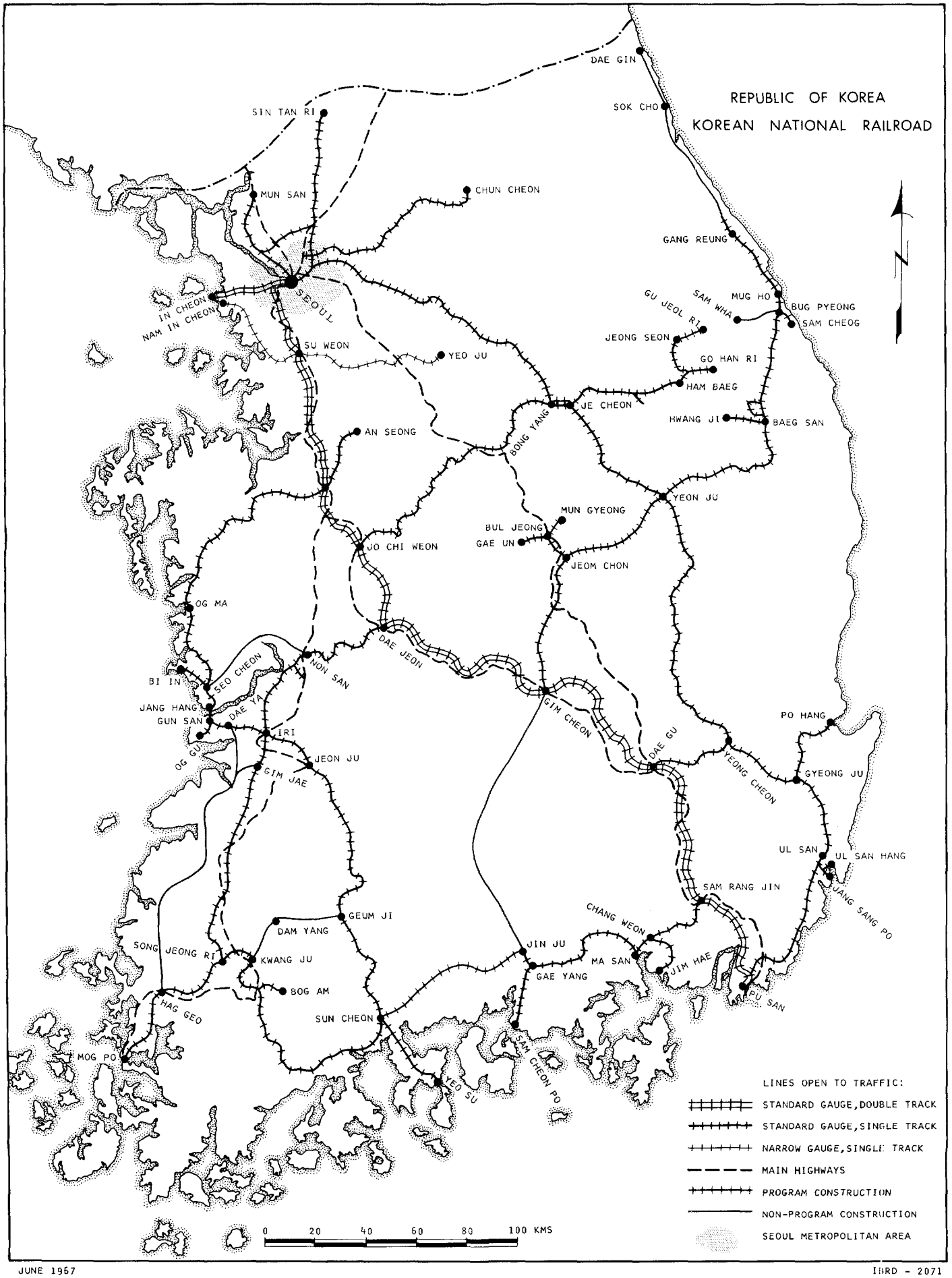
* Consultant studies currently under consideration.
** Cost to be shared with other parties concerned.

Marshalling Yards KNR plan large investments in marshalling yards in the Seoul area and also at Bon Yang, Je Cheon, Yeon Ju and Jeom Chou, in the next five years. Ul San yard may also require to be relocated and enlarged in this period. In addition, extensions and enlargements are considered necessary at various smaller railroad centers. It is considered that the problem of the location, size and type of marshalling yards in relation to traffic flows and operating requirements should be studied by consultants.

The appointment of consultants for coal traffic in the Seoul area should be a condition of effectiveness of the proposed credit or of disbursement from the credit account; the appointment of other consultants should be made in accordance with a schedule to be agreed during negotiations.

Uneconomic lines The transportation survey identified seven existing lines which are not yielding revenues sufficient to cover costs. There is need for consultants to review the economics of these lines in detail and advise on appropriate action.

November 21, 1967



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